# Multi-Resolution Environments in Simulations Workshop

12 - 13 August 1996

# Multi-Resolution Environments in Simulations Workshop Agenda

## DAY 1, Monday, August 12, 1996:

| | Topic/Organization | Presenter |
|---|---|---|
| 1300 - 1310 | Introduction and Opening Remarks | DMSO |
| 1310 - 1355 | Why Multi-Resolution Terrain is the Wrong Solution - Are We Really Asking the Right Question? | Dr. Paul Birkel - MITRE |
| 1355 - 1440 | College of Computing, Georgia Institute of Technology - Connecting the User with Multi-Resolution Environments | Nickolas Faust |
| 1440 - 1455 | Break | |
| 1455 - 1540 | Digital Mapping Laboratory Carnegie Mellon University | Professor David McKeown |
| 1530 - 1615 | Argonne National Laboratory | Dr. John Hummel |
| 1615 - 1700 | Terrain Feature Generator Technology Overview | Harold McDaniel - Intergraph |
| 1700 - 1730 | Lockheed-Martin Tactical Defense Systems Special Operations Forces Aircrew Training System | Ed Quinn |
| 1730 - 1800 | USAF Directorate of Weather - The Joint Strike Fighter Environment | Lt Col Harold Massie |

DAY 2, Tuesday, August 13, 1996 ;

| | Topic/Organization | Presenter |
|---|---|---|
| 0800 - 0805 | Opening Remarks | DMSO |
| 0805 - 0850 | The Improved Computer Generated Forces Terrain Database (ICTDB) | Tom Stanzione - TASC |
| 0850 - 0935 | Nichols Research Corporation<br>FASTPROP Methodology for Multi-Resolution Atmosphere Weather Scene Simulation | Wendell Cook |
| 0935 - 0950 | Break | |
| 0950 - 1035 | NRL Monterey Program Perspective | Steve Lowe - SAIC |
| 1035 - 1120 | Analysis & Technology, Inc.<br>Resolution & Fidelity Issues for Underwater Acoustic Environmental Modeling | Robert J. Howard |
| 1120 - 1205 | Total Atmosphere & Ocean Server | David Whitney - TASC |
| 1205 - 1305 | Lunch | |
| 1305 - 1405 | Lockheed-Martin Advanced Distributed Simulation Dynamic Virtual World Program | Richard Schaffer |
| 1405 - 1435 | US Army Topographic Engineering Center | Jungwhan John Kim |
| 1435 - 1450 | Break | |
| 1450 - 1535 | Institute for Simulation & Training<br>University of Central Florida | Brian Goldiez |
| 1535 - 1605 | Distributed Maritime Simulation - A Case Study | Dr. George Heburn |
| 1605 - 1705 | Interoperability: It’s time for action | Farid Mamaghani |
| 1705 - 1730 | Workshop Wrap Up | DMSO |

# Multi-Resolution Environments in Simulations

**Purpose:** Develop a baseline understanding of the current state of the practice in technical approaches applicable to the description, generation, and management of simulation and federation environments involving multi-resolution interaction.

**Focus:** Technical discussion of current implementations of multi-resolution environments as a base for initiating future technical direction and investments.

# Terms of Reference

**Objectives:** Discuss the design factors and enabling technologies involved in multi-resolution simulations. Of specific interest are the various processes and procedures used in representing the environment at varying resolutions to achieve consistency and promote interoperability. For purposes of this workshop, discussion should address the simulation of the natural condition (to include fixed objects) of the terrain, ocean, atmosphere, and space. Discussion should also encompass factors involved in dynamic change within the environment caused by nature and human effects.

# Items of Specific Interest

- Comparison of environmental impacts on models controlling emitters, sensors, and computer generated forces
- Correlation of environmental components across a broad range of applications
- Definition of fidelity requirements

## Definitions:

- Resolution: granularity of the data or model output
- Fidelity: accuracy of the data or model

1. **Resolution:** What are the various simulation factors which define the resolution required for the environment? What factors connect resolution to fidelity?

2. **Critical components in multi-resolution environment interaction:** What are critical components in achieving consistent multi-resolution interaction in the terrain, ocean, atmosphere, and space? How are these critical components derived or implemented? How is consistency maintained between different levels of resolution for these critical components?

3. **Changing levels of resolution:** Do level of resolution requirements change during multi-resolution simulation runtime? What instigates the need for change in resolution? How does the change in resolution occur? Does the change in resolution occur both from high level of detail to lower level of detail, and back? Is data lost through the transition? If data originally supported a lower level of detail, how does it gain information to represent the higher level of detail? If the level of resolution changes, what is the mechanism used to determine how much of the environmental representation needs to change resolution, and how often? Does a change in resolution trigger additional changes? How are the changes in resolution controlled?

4. **Multiple views of the mission space:** What are the factors which result in alternate views of the mission space environment? What are strategies to ensure "meaningful interaction" of federation participants?

**5. Environment design:** How does an environment design accommodate multi-resolution requirements? How are the various data and models integrated? What procedures are used to ensure that model outputs at different levels of fidelity and different levels of resolution are consistent ? What is done to ensure consistency between networked simulations? What is done to ensure consistency across domains or at database/inset boundaries for seamless representation?

**6. Simulation management:** Computational requirements are expected to change as a function of changing resolution. These changes are expected to occur during simulation runtime. How are these changes in resolution managed? How are resources allocated and prioritized to ensure the simulation resources can support resolution change?

**7. Control of multi-resolution environments:** What controls during runtime are required for federate/federation control of the environmental representation? How do control mechanisms change as a function of multi-resolution requirements?

**8. Environmental databases:** What are the database generation requirements? How is consistency between different resolutions maintained? How are changes made during runtime? How is multi-resolution consistency maintained through runtime?

**9. Federate fidelity requirements:** How should environmental fidelity requirements be identified ? What are key factors in determining fidelity requirements in federation design, to include multi-resolution strategy selections and implementations?

**10. Metrics & Tools:** What metrics and tools should be available to assess environmental factors regarding the quality of federate capability and federation interaction for V&V? What environmental V&V parameters should be retained and stored as simulation/federation information?

Workshop documentation will be available electronically through the DMSO homepage:

www.DMSO.mil

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